Turfgrass Growth in Acid Soil Treated by Flue Gas Desulfurization (FGD) Gypsum or Traditional Calcium Amendments

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KEYWORDS: fertility, soil acidity, lime, aluminum toxicity, root growth, drought stress, nutrition, tall fescue

ABSTRACT

Subsurface acidity, typical of Ultisols worldwide, limits nutrient acquisition, root elongation, and drought tolerance of typically-deep-rooting turfgrasses. This greenhouse study objective was to compare effects of $CaCl_2$•$2H_2O$, calcitic lime, or either anthropogenically-synthesized or mined gypsum ($CaSO_4$•$2H_2O$) surface application on growth, nutrition, and quality of tall fescue, TF (*Festuca arundinacea* Schreb.). Homogenized upland SE US Piedmont soil (pHw = 4.9) was used to fill 30 polyvinyl-chloride columns (70 x 7.6 cm i.d.). Prior to seeding, amendments or lime were surface-applied at rates of 3600 or 1900 kg Ca/ha, respectively. Potable H_2O was liberally applied each month to mimic seasonal leaching conditions. Leachate chemistry and TF shoot density, growth, and elemental concentrations were measured regularly. Root length density and specific root length of TF were assessed 27 mo following treatment applications. Leachate data showed rapid solute transport from surface applications of $CaCl_2$, followed by $CaSO_4$. Either $CaSO_4$ treatment significantly increased leaf Ca compared to the control, and leaf S compared to control and lime treatments. Either $CaSO_4$ treatment significantly increased TF shoot growth and root proliferation the 39-62 cm soil depth, compared to lime or control treatments. No treatment resulted in significantly greater accumulations of regulated metals in TF tissue. Over 2 yr of leaching conditions, 16 000 kg/ha surface applications of $CaSO_4$ improved TF quality through enhanced root growth in acidic subsoil horizons 60 cm deep. Subsurface acidity within maintained TF systems may be more effectively ameliorated by surface applications of gypsum or gypsum/lime combinations than by traditional liming agents alone.